

# ETHERS

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COURSE: CHM103

Assignment

- 1) Give the IUPAC names of the following organic compounds:  
i)  $\text{CH}_3\text{OCH}_3$  ii)  $\text{CH}_3\text{CH}_2\text{OCH}_2\text{CH}_3$  iii)  $(\text{C}_2\text{H}_5\text{O})_2\text{C}$   
iv)  $\text{CH}_3\text{CH}_2\text{OCH}_3$  v)  $\text{CH}_3\text{CH}_2\text{CH}_2\text{OCH}_2\text{CH}_3$

Answer

- i)  $\text{CH}_3\text{OCH}_3$  - Methoxymethane  
ii)  $\text{CH}_3\text{CH}_2\text{OCH}_2\text{CH}_3$  - Ethoxyethane  
iii)  $(\text{C}_2\text{H}_5\text{O})_2\text{C}$  - Diethoxymethane  
iv)  $\text{CH}_3\text{CH}_2\text{OCH}_3$  - Methoxyethane  
v)  $\text{CH}_3\text{CH}_2\text{CH}_2\text{OCH}_2\text{CH}_3$  - Ethoxypropane

2) Discuss the properties of ethers

i) Physical states

Ethers are colourless, neutral liquids with pleasant odours at room temperature. The lower aliphatic ethers are highly flammable gases or volatile liquids.

ii) Solubility

Ethers are less soluble in water than their corresponding alcohols. The lower molecular weight ethers are fairly soluble in water since they are able to form hydrogen bonds with the water molecules but as the hydrocarbon content of the molecules increases, the solubility decreases. They are miscible with most organic solvents.

iii) Density

Most of the simple ethers are less dense than water, although the density increases with increasing relative molecular mass and some of the aromatic ethers are denser than water.

iv) Reactivity

Ethers are inert at moderate temperature and this leads to their wide use as reaction media. Simple ethers are not commonly found in nature but the ether linkage is present in natural products such as sugars, starches and cellulose.

3) Boiling point  
 Low molecular mass ethers have a lower boiling point than the corresponding alcohols but the ethers containing alkyl radicals larger than four carbon atoms, the reverse is true. The boiling point of ethers tend to approximate those of hydrocarbons of some relative molecular mass from which it can be concluded that the molecules are not associated in the liquid phase as there are no suitably available hydrogen for association through hydrogen bonds.

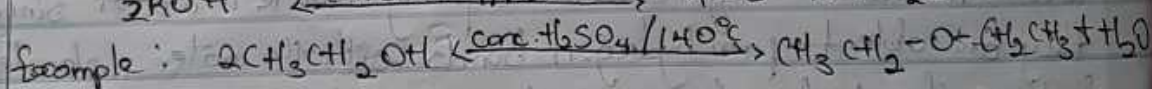
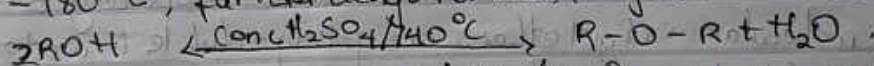
3. Discuss explicitly two methods of preparing ethers and show equations of reaction.

Answer

i) Partial dehydration of alcohols.

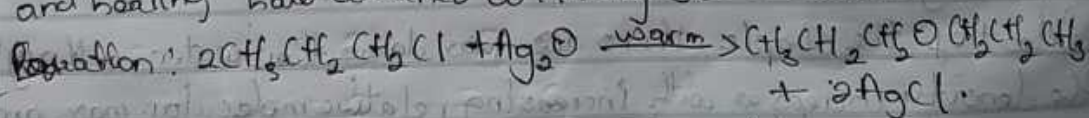
Simple ethers are manufactured from alcohols by catalytic dehydration. The alcohol in excess and concentrated tetraoxo-sulphate (vi) acid is heated at a carefully maintained temperature of  $140^{\circ}\text{C}$ . This process is known as continuous etherification.

If excess alcohol is not used, the temperature is as high as  $170 - 180^{\circ}\text{C}$ , further dehydration to yield alkene occurs.



ii) From halo alkane and dry silver (I) oxide.

Ethers can also be prepared by using Williamson's synthesis and heating halo alkanes with dry silver oxide.



4) State three uses of ethylene oxide.

i. It is used as an intermediate in the hydrolytic manufacture of ethylene glycol.

ii. It is used in the preparation of nonionic emulsifying agents, plasticizers and several synthetic textiles.

iii. It is also used as a gaseous sterilizing agent.

